WHAT IS CLAIMED IS:

1.   A family of chemical tags, each chemical tag comprising a core and a plurality of substituents attached directly to the core, wherein the substituents of each chemical tag form a subset of a closed set of possible substituents.

2.   The family of claim 1, wherein each member of the family includes a different subset of substituents.

3.   The family of claim 1, wherein the subset of substituents includes a repeating unit that is the same for all substituents of the subset.
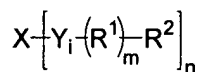
4.   The family of claim 1, wherein the core is based on a polyhydroxy alkane.

5.   The family of claim 4, wherein the polyhydroxy alkane is ethylene glycol, propylene glycol, glycerol, pentaerythritol, or a carbohydrate.

6.   The family of claim 1, wherein each chemical tag includes a charged or ionizable moiety.

7.   The family of claim 1, wherein each chemical tag includes a chromophore or fluorophore.

8.   The family of claim 1, wherein each chemical tag has the formula:

$$X \left[Y_i \left(R^1 \right)_m R^2 \right]_n$$

wherein

     X is a substituted or unsubstituted alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl group;

     each Y is, independently, selected from the group consisting of: $-CR^aR^b-$, $-C(O)-$, $-S(O)-$, $-S(O)_2-$, $-O-$, and $-NR^a-$, where each R^a and each R^b are, independently, hydrogen, halo, or a substituted or unsubstituted C_1-C_6 alkyl group;

     each i is, independently, 1, 2, 3, 4, 5 or 6;

     each R^1 is, independently, straight chain alkylene, branched chain alkylene, cycloalkylene, heterocycloalkylene, alkoxy, acyl, alkenylene, cycloalkenylene,

12   heterocycloalkenylene, alkynylene, arylene, aralkylene, or heteroarylene, each R^1

13   independently being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl,

14   cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo,

15   haloalkyl, amino, aryl, or aralkyl group;

16   each R^2 is, independently, hydrogen or straight chain alkyl, branched chain alkyl,

17   cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl,

18   alkynyl, aryl, aralkyl, or heteroaryl, each R^2, independently, being optionally substituted with

19   one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl,

20   alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

21   n is an integer ranging from 1 to 10; and

22   each m is, independently, an integer ranging from 0 to 100.

1   9.   The family of claim 8, wherein each Y is, independently, a group including

2   one or more of the following moieties: $-CH_2-$, $-C(O)-$, $-NR^a-$, or $-O-$.

1   10.   The family of claim 8, wherein all R^1 are identical in at least one $-Y_i(R^1)_m-R^2$

2   group.

1   11.   The family of claim 8, wherein each R^1 is identical in more than one

2     $-Y_i(R^1)_m-R^2$ group.

1   12.   The family of claim 8, wherein n is an integer ranging from 2 to 8.

1   13.   The family of claim 8, wherein n is 3, 4, 5 or 6.

1   14.   The family of claim 8, wherein each R^1 is a straight chain alkyl group or a

2   branched chain alkyl group.

1   15.   The family of claim 14, wherein each R^2 is hydrogen.

1   16.   The family of claim 15, wherein each Y is $-CH_2O-$; X is H_2N-CH_2-C-; and n is

2   3.

1   17.   The family of claim 8, wherein each chemical tag includes a linker group.

1   18.   The family of claim 17, wherein at least one chemical tag is attached to a solid

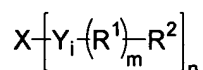2 support through the linker group.

1   19.   A plurality of different chemical tags each tag comprising a core and a

2 plurality of substituents attached to the core, at least one substituent including a repeating

3 unit, and each different chemical tag including the repeating unit.

1   20.   The chemical tags of claim 19, wherein each tag has a mass distinguishable

2 from the mass of other tags of the plurality.

1   21.   The chemical tags of claim 19, wherein the core of each tag is the same.

1   22.   The chemical tags of claim 19, wherein each tag includes a different number

2 of repeating units.

1   23.   The chemical tags of claim 19, wherein at least one tag has the formula:

$$X \left[Y_i \left(R^1 \right)_m R^2 \right]_n$$

2

3 wherein

4   X is a substituted or unsubstituted alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl,

5 alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl group;

6   each Y is, independently, selected from the group consisting of: $-CR^aR^b$-, $-C(O)$-,

7 $-S(O)$-, $-S(O)_2$-, $-O$-, and $-NR^a$-, where each R^a and each R^b are, independently, hydrogen,

8 halo, or a substituted or unsubstituted C_1-C_6 alkyl group;

9   each i is, independently, 1, 2, 3, 4, 5 or 6;

10   each R^1 is, independently, straight chain alkylene, branched chain alkylene,

11 cycloalkylene, heterocycloalkylene, alkoxy, acyl, alkenylene, cycloalkenylene,

12 heterocycloalkenylene, alkynylene, arylene, aralkylene, or heteroarylene, each R^1

13 independently being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl,

14 cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo,

15 haloalkyl, amino, aryl, or aralkyl group;

16   each R^2 is, independently, hydrogen or straight chain alkyl, branched chain alkyl,

17 cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl,

18 alkynyl, aryl, aralkyl, or heteroaryl, each R^2, independently, being optionally substituted with

19   one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl,

20   alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

21   n is an integer ranging from 1 to 10; and

22   each m is, independently, an integer ranging from 0 to 100.

1   24.   The chemical tags of claim 23, wherein each tag has a different total m.

1   25.   The chemical tags of claim 23, wherein each Y is, independently, a group

2   including one or more of the following moieties: $-CH_2-$, $-C(O)-$, $-NR^a-$, or $-O-$.

1   26.   The chemical tags of claim 23, wherein each R^1 is identical in at least one

2    $-Y_i(R^1)_m R^2$ group.

1   27.   The chemical tags of claim 23, wherein each R^1 is identical in more than one

2    $-Y_i(R^1)_m R^2$ group.

1   28.   The chemical tags of claim 23, wherein n is an integer ranging from 2 to 8.

1   29.   The chemical tags of claim 23, wherein n is 3, 4, 5 or 6.

1   30.   The chemical tags of claim 23, wherein each R^1 is a straight chain alkyl group

2   or a branched chain alkyl group.

1   31.   The chemical tags of claim 23, wherein each R^1 is $-CH_2-$ and each R^2 is

2   hydrogen.

1   32.   The chemical tags of claim 23, wherein each tag has a mass distinguishable

2   from the mass of from other tags of the plurality.

1   33.   A method of making a chemical tag comprising:

2   selecting a subset of substituents from a closed set of possible substituents; and

3   attaching each substituent of the subset directly to a core.

1   34.   The method of claim 33, wherein the subset includes at least two substituents.

1   35.   The method of claim 33, wherein at least one substituent in the closed set of
2 possible substituents includes a repeating unit.

1   36.   The method of claim 33, further comprising attaching a linker group to the
2 core.

1   37.   The method of claim 36, further comprising attaching the tag to a solid
2 support through the linker group.

1   38.   A method of making a family of chemical tags, comprising:
2   selecting a first subset of substituents and a second subset of substituents from a
3 closed set of possible substituents;
4   attaching each substituent of the first subset directly to a first core; and
5   attaching each substituent of the second subset directly to a second core.

1   39.   The method of claim 38, wherein at least one substituent in the closed set of
2 possible substituents includes a repeating unit.

1   40.   The method of claim 39, wherein the first subset and the second subset
2 include different numbers of repeating units.

1   41.   A method of tracking an object comprising:
2   associating a chemical tag with an object, wherein the chemical tag includes a core
3 and a plurality of substituents attached directly to the core, wherein the substituents of each
4 chemical tag form a subset of a closed set of possible substituents;
5   identifying the tag; and
6   correlating the identity of the chemical tag with the object.

1   42.   The method of claim 41, wherein associating includes attaching the tag to the
2 object.

1   43.   The method of claim 41, wherein identifying includes separating the tag from
2 the object.

1   44. The method of claim 41, wherein identifying includes determining a mass of

2 the tag.

1   45. The method of claim 41, wherein identifying includes determining a

2 chromatographic retention time of the tag.

1   46. The method of claim 41, further comprising associating a second chemical tag
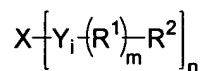
2 with the object.

1   47. The method of claim 46, further comprising identifying the second chemical

2 tag.

1   48. The method of claim 41, further comprising chemically transforming the

2 object before or after associating the chemical tag with the object.

1   49. The method of claim 41, wherein the object includes a support for solid phase

2 synthesis.

1   50. The method of claim 49, wherein the support is attached to a member of a

2 library of compounds.

1   51. The method of claim 41, wherein the tag has the formula:

$$X {\left[Y_i {\left(R^1 \right)}_m R^2 \right]}_n$$

2

3 wherein

4 X is a substituted or unsubstituted alkyl, cycloalkyl, heterocycloalkyl, alkoxy, acyl,

5 alkenyl, cycloalkenyl, heterocycloalkenyl, alkynyl, aryl, aralkyl, or heteroaryl group;

6   each Y is, independently, selected from the group consisting of: $-CR^aR^b-$, $-C(O)-$,

7 $-S(O)-$, $-S(O)_2-$, $-O-$, and $-NR^a-$, where each R^a and each R^b are, independently, hydrogen,

8 halo, or a substituted or unsubstituted C_1-C_6 alkyl group;

9   each i is, independently, 1, 2, 3, 4, 5 or 6;

10   each R^1 is, independently, straight chain alkylene, branched chain alkylene,

11 cycloalkylene, heterocycloalkylene, alkoxy, acyl, alkenylene, cycloalkenylene,

12 heterocycloalkenylene, alkynylene, arylene, aralkylene, or heteroarylene, each R^1

13 independently being optionally substituted with one or more of an alkyl, cycloalkyl, alkenyl,

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14   cycloalkenyl, alkynyl, amino, alkylamino, acyl, alkoxy, hydroxyl, hydroxyalkyl, halo,

15   haloalkyl, amino, aryl, or aralkyl group;

16   each R^2 is, independently, hydrogen or straight chain alkyl, branched chain alkyl,

17   cycloalkyl, heterocycloalkyl, alkoxy, acyl, alkenyl, cycloalkenyl, heterocycloalkenyl,

18   alkynyl, aryl, aralkyl, or heteroaryl, each R^2, independently, being optionally substituted with

19   one or more of an alkyl, cycloalkyl, alkenyl, cycloalkenyl, alkynyl, amino, alkylamino, acyl,

20   alkoxy, hydroxyl, hydroxyalkyl, halo, haloalkyl, amino, aryl, or aralkyl group;

21   n is an integer ranging from 1 to 10; and

22   each m is, independently, an integer ranging from 0 to 100.

1   52.   A method of tracking an object comprising:

2   associating a plurality of different chemical tags with a plurality of objects, wherein

3   each different chemical tag includes a core and a plurality of substituents attached directly to

4   the core, at least one of the substituents including a repeating unit, each different tag

5   including the repeating unit;

6   determining the identity of an individual tag of the plurality of tags; and

7   correlating the identity of the individual tag with an object of the plurality of objects.

1   53.   The method of claim 52, wherein associating includes attaching the plurality

2   of different chemical tags to the object.

1   54.   The method of claim 52, wherein identifying includes separating the plurality

2   of different chemical tags from the object.

1   55.   The method of claim 52, wherein identifying includes determining a mass of

2   each of the different chemical tags.

1   56.   The method of claim 52, wherein identifying includes determining a

2   chromatographic retention time of the each of the different chemical tags.

1   57.   The method of claim 52, wherein the object includes a support for solid phase

2   synthesis.

1   58.   The method of claim 57, wherein the support is attached to a member of a

2   library of compounds.